

WHAT IS CLAIMED IS:

1. A pressure/vacuum converting machine for converting an input force from an expandable bladder into at least one pneumatic actuation force, the converting machine comprising a pressure vessel adapted to receive at least a portion of the bladder therein and defining a gas volume not occupied by the bladder within the vessel, the gas volume of the pressure vessel decreasing as the bladder expands thereby increasing the gas pressure in the gas volume, a pneumatic actuator in fluid communication with the gas volume of the pressure vessel such that pressure in the gas volume drives operation of the pneumatic actuator.

2. A pressure/vacuum converting machine as set forth in claim 1 wherein the pneumatic actuator has a force output comprising a positive pressure output and a negative pressure output, the positive and negative pressure outputs occurring at least partially at the same time.

3. A pressure/vacuum converting machine as set forth in claim 2 wherein further comprising an energy storage device arranged with respect to the pneumatic actuator for storing energy created by the increased pressure in the pressure vessel as a result of expansion of the bladder into the pressure vessel.

4. A pressure/vacuum machine as set forth in claim 3 wherein the pneumatic actuator comprises a cylinder and a piston head slidingly and sealingly received for movement within the cylinder, the piston head being adapted to move under influence of increased gas pressure from the pressure vessel.

5. A pressure/vacuum machine as set forth in claim 4 wherein the energy storage device comprising a spring operatively engaging the piston head and yieldably

opposing said movement of the piston head under influence  
of increased gas pressure from the pressure vessel.

6. A pressure/vacuum machine as set forth in  
claim 4 wherein the piston head divides the cylinder into  
two regions, one of the regions being in fluid  
communication with the gas volume of the pressure vessel  
and the other region being blocked by the piston head from  
fluid communication with the gas volume, the cylinder being  
constructed to maintain said other volume substantially at  
a neutral pressure as the piston head moves in the  
cylinder.

7. A pressure/vacuum machine as set forth in  
claim 4 wherein the cylinder and piston head of the  
pneumatic actuator comprises a first cylinder and a first  
piston head, and wherein the pneumatic actuator further  
comprises a second cylinder and a second piston head  
adapted for sliding and sealing engagement in the second  
cylinder to divide the second cylinder into two regions,  
the second piston head being operatively connected to the  
first piston head for conjoint movement therewith.

8. A pressure/vacuum machine as set forth in  
claim 1 wherein the pneumatic actuator comprises a cylinder  
and a piston head slidably and sealingly received for  
movement within the cylinder, the piston head being adapted  
to move under influence of increased gas pressure from the  
pressure vessel.

9. A pressure/vacuum machine as set forth in  
claim 8 wherein the piston head divides the cylinder into  
two regions, one of the regions being in fluid  
communication with the gas volume of the pressure vessel  
and the other region being blocked by the piston head from  
fluid communication with the gas volume, the cylinder being  
constructed to maintain said other volume substantially at

a neutral pressure as the piston head moves in the cylinder.

10. A pressure/vacuum machine as set forth in claim 8 wherein the cylinder and piston head of the pneumatic actuator comprises a first cylinder and a first piston head, and wherein the pneumatic actuator further  
5 comprises a second cylinder and a second piston head adapted for sliding and sealing engagement in the second cylinder to divide the second cylinder into two regions, the second piston head being operatively connected to the first piston head for conjoint movement therewith.

11. A pressure/vacuum machine as set forth in claim 10 wherein the pressure vessel comprises a first pressure vessel, and wherein the machine further comprises a second pressure vessel adapted to at least partially  
5 receive a second bladder, and passaging connected to the second pressure vessel from the second cylinder whereby upon movement of the second piston head in one direction when the first bladder expands, vacuum pressure is applied from the second cylinder to the second pressure vessel to  
10 expand the second bladder, and upon movement of the second piston head in the opposite direction when the first bladder contracts, positive pressure is applied from the second cylinder to the second pressure vessel to compress the second bladder.

12. A pressure/vacuum machine as set forth in claim 11 further comprising a third pressure vessel adapted to at least partially receive a third bladder, and  
5 passaging connected to the third pressure vessel from the second cylinder whereby upon movement of the second piston head in one direction when the first bladder expands, positive pressure is applied from the second cylinder to the third pressure vessel to compress the third bladder, and upon movement of the second piston head in the opposite

10 direction when the first bladder contracts, vacuum pressure is applied from the second cylinder to the third pressure vessel to expand the third bladder.

13. A pressure/vacuum machine as set forth in claim 12 in combination with the first, second and third bladders.

14. A pressure/vacuum machine as set forth in claim 13 wherein the first, second and third bladders are made of a resilient material.

15. A pressure/vacuum machine as set forth in claim 13 further comprising passaging connecting the first and second bladders to the third bladder.

16. A pressure/vacuum machine as set forth in claim 10 further comprising at least one pneumatic valve operated by the pneumatic actuator to open and close for use in controlling flow of fluent material.

5 17. A pressure/vacuum machine as set forth in claim 16 wherein said one pneumatic valve is connected to the pneumatic actuator so that said one pneumatic valve is open upon application of one of: positive fluid pressure and negative fluid pressure.

18. A pressure/vacuum machine as set forth in claim 17 wherein said one pneumatic valve is biased to a closed position.

19. A pressure/vacuum machine as set forth in claim 18 wherein said one pneumatic valve comprises a spring for biasing said one valve to the closed position.

20. A pressure/vacuum machine as set forth in claim 16 comprising multiple pneumatic valves, each pneumatic valve being connected to the pneumatic actuator so that each of said one pneumatic valve is open upon application of one of: positive fluid pressure and negative fluid pressure.

21. A pressure/vacuum machine as set forth in claim 20 wherein two of said pneumatic valves are open and one of said valves is closed upon application of vacuum pressure from the pneumatic actuator.

22. A fluent material dispenser powered by fluent material from a source of fluent material under pressure to act upon a flexible container to dispense fluent material used to power the dispenser, the fluent material dispenser comprising:

a first pressure vessel sized and shaped to receive a first portion of the flexible container therein in sealing relation with the flexible container first portion;

a second pressure vessel sized and shaped to receive a second portion of the flexible container therein in sealing relation with the flexible container second portion to define a gas volume within the second pressure vessel;

a valve for selectively connecting the second portion of the flexible container to the source of fluent material under pressure such that the second portion is capable of expanding into the second pressure vessel to reduce the gas volume and increase the gas pressure in the second pressure vessel;

a pneumatic actuator in fluid communication with the gas volume of the second pressure vessel and adapted for employing energy from the increased gas pressure caused by expansion of the second portion into the second pressure vessel to deflect the first portion and move fluent

material within the first portion, and to store energy to act on the second portion of the flexible container to displace fluent material therefrom when the valve is closed whereby fluent material is dispensed.

23. A fluent material dispenser as set forth in claim 22 wherein the pneumatic actuator is connected and arranged to apply a positive pressure to the first pressure vessel gas volume and first portion when the pressure of the gas volume in the second pressure vessel is increased by expansion of the second portion within the second pressure vessel.

24. A fluent material dispenser as set forth in claim 22 wherein the pneumatic actuator is connected and arranged to apply a vacuum pressure to the first pressure vessel gas volume and first portion when the pressure of the gas volume in the second pressure vessel is increased by expansion of the second portion within the second pressure vessel.

25. A fluent material dispenser as set forth in claim 24 further comprising a third pressure vessel sized and shaped to receive a third portion of the flexible container therein in sealing relation with the flexible container third portion, the third pressure vessel being connected to the pneumatic actuator so that a positive pressure is applied to the third pressure vessel and third portion when the pressure of the gas volume in the second pressure vessel is increased by expansion of the second portion within the second pressure vessel.

26. A fluent material dispenser as set forth in claim 25 wherein the valve comprises a first valve, the dispenser further comprising second and other valves for selectively flow of fluent material into and out of the first, second and third portions.

27. A fluent material dispenser as set forth in claim 26 wherein at least one of the first, second and other valves is a pneumatic valve operated by the pneumatic actuator.

28. A fluent material dispenser as set forth in claim 27 wherein said one pneumatic valve is connected to the pneumatic actuator so that said one pneumatic valve is open upon application of one of: positive fluid pressure  
5 and negative fluid pressure.

29. A fluent material dispenser as set forth in claim 28 wherein said one pneumatic valve is biased to a closed position.

30. A fluent material dispenser as set forth in claim 29 wherein said one pneumatic valve comprises a spring for biasing said one valve to the closed position.

31. A fluent material dispenser as set forth in claim 27 comprising multiple pneumatic valves, each pneumatic valve being connected to the pneumatic actuator so that it is open upon application of one of: positive  
5 fluid pressure and negative fluid pressure.

32. A fluent material dispenser as set forth in claim 31 wherein two of said pneumatic valves are open and one of said valves is closed upon application of vacuum pressure from the pneumatic actuator.

33. A fluent material dispenser as set forth in claim 26 in combination with the flexible container, the flexible container comprising passaging therein interconnecting the first, second and third portions of the  
5 flexible container and an outlet, the passaging being capable of carrying fluent material from the first and

second portions to the third portion for dispensing to the outlet.

34. A fluent material dispenser in combination with the flexible container as set forth in claim 33 wherein the fluent material from the first portion is different than the fluent material from the second portion.

35. A fluent material dispenser in combination with the flexible container as set forth in claim 34 wherein the fluent material from the first portion is an beverage concentrate.

36. A fluent material dispenser in combination with the flexible container as set forth in claim 35 wherein the beverage concentrate is one of: orange juice concentrate.

37. A method for dispensing fluent material using the pressure of fluent material from a source of fluent material under pressure, the method comprising:

- admitting fluent material under pressure into an elastic first bladder such that the first bladder expands in volume;

- converting expansion of the elastic bladder into positive gas pressure;

- driving a pneumatic actuator with the positive gas pressure to effect one of expansion and compression of an elastic second bladder to move fluent material within the second bladder;

- storing energy from the positive gas pressure;
- shutting off admission of fluent material under pressure into the first bladder;

- driving the pneumatic actuator with the stored energy to compress the first bladder and to effect the other of expansion and compression of the second bladder for use in dispensing fluent material.

38. A method as set forth in claim 37 wherein said step of driving a pneumatic actuator with the positive gas pressure comprises driving the pneumatic actuator to give a positive pressure output and a vacuum pressure output at the same time.

39. A pneumatic valve system comprising a valve including a cylinder and a piston biased to one of a valve open position and a valve closed position, a pneumatic actuator in fluid communication with the valve for applying at least one of a positive and negative pressure to the valve, the actuator being connected to the valve to move the piston against its bias to the other of the valve open and valve closed positions upon application of said one pressure.

40. A pneumatic valve system as set forth in claim 39 wherein the valve constitutes a first valve and wherein the valve system further comprises a second valve including a cylinder and a piston biased to one of a valve open position and a valve closed position, the pneumatic actuator being in fluid communication with the second valve for applying at least one of a positive and negative pressure to the valve, the actuator being connected to the second valve to move the piston against its bias to the other of the valve open and valve closed positions upon application of said one pressure.

41. A pneumatic valve system as set forth in claim 40 wherein the first valve is moved to the valve open position upon application of one of said positive and negative pressures by the pneumatic actuator, and the second valve is moved to the valve closed position upon application of said one pressure.

42. A pneumatic valve system as set forth in claim 40 wherein the first valve further comprises a spring in the cylinder biasing the piston to the valve closed position and the second valve further comprises a spring in the cylinder biasing the piston to the valve closed position.

43. A pneumatic valve system as set forth in claim 40 further comprising a third valve including a cylinder and a piston biased to one of a valve open position and a valve closed position, the pneumatic actuator being in fluid communication with the third valve for applying at least one of a positive and negative pressure to the valve, the actuator being connected to the third valve to move the piston against its bias to the other of the valve open and valve closed positions upon application of said one pressure.